



FACT SHEET



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NATIONAL MISSILE DEFENSE INTEGRATED FLIGHT TEST FOUR (IFT-4)



INTRODUCTION

The National Missile Defense (NMD) program is being developed by the Ballistic Missile Defense Organization's (BMDO) NMD Joint Program Office (JPO). Its purpose is to protect all 50 states from a limited number of long-range ballistic missiles launched from a rogue nation or as a result of an accidental or unauthorized launch from a current nuclear power.

The focus of the Integrated Flight Tests (IFTs) is to provide the data needed to assess NMD's developing capabilities, system performance, and overall system maturity. Analysis of data collected from the IFTs is required to assess NMD maturity and capability prior to the DRR.

In 1998, BMDO awarded a Lead Service Integrator (LSI) contract to the Boeing Corporation to bring together the development of the NMD elements under centralized management. The LSI manages the Payload Launch Vehicle (PLV) [Lockheed Martin Missiles and Space], the Exoatmospheric Kill Vehicle (EKV) [Raytheon Missile Systems Co.], Battle Management/Command Control and Communications (BMC3) [TRW], Ground Based Radar-Prototype (GBR-P) [Raytheon Systems Co.]. The government furnishes targets and test assets, and oversees the flight testing.

INTEGRATED FLIGHT TEST PROGRAM

The IFT program incorporates developmental flight tests that are carefully designed to answer specific questions about elements of the NMD system. The EKV, GBR-P, BMC3 system, and other ground based sensors participate in weapon system flight tests to test their individual capability and, at the integrated system level, to test their compatibility to work together. IFTs use targets (a look-alike dummy warhead, or Reentry Vehicle (RV) and decoys) launched from Vandenberg Air Force Base (VAFB), California, toward the Kwajalein Missile Range (KMR) situated in the Kwajalein Atoll of the Republic of the Marshall Islands located about 4,300 miles away in the mid-Pacific Ocean. The NMD program conducted two successful non-intercept sensor fly-bys of the test targets in 1997 and 1998. During these tests, operation of the EKV sensor package was completely validated in the flight environment and data was collected to refine target discrimination algorithms for subsequent intercept tests. In October 1999, the first EKV intercept was successfully conducted in IFT-3 with spectacular results.

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IFT-4 was the second intercept attempt and the first test to include all elements, or their representations. The primary objectives of this mission included demonstrating EKV flight test performance, NMD system performance, and operation of sensors. The EKV performance was measured by the ability of the EKV to: (1) separate/deploy from the Payload Launch Vehicle (PLV) and orient toward the target complex, (2) acquire the target complex, (3) track the objects in the target complex, (4) discriminate the objects in the target complex, (5) select the RV and divert/home toward the RV and (6) intercept the RV. Secondary objectives included demonstrating the NMD integrated system functional capability (the GBR-P's ability to detect, acquire and track the target complex and BMC3's ability to integrate and orchestrate system elements) and collecting data for: (1) models and simulations, (2) element and system performance analyses, (3) impact and lethality analyses, and (4) system improvements for IFT-5.

On January 18, 2000, NMD conducted the IFT-4 weapon system test engagement. At 10:19 pm (EST), IFT-4 began with the launch of the target complex aboard an Air Force Minuteman II missile body equipped with the Multi-Service Launch System, from VAFB toward KMR. The test target and decoy are designed to represent the type of

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threat likely to be used by a rogue nation against any of our 50 states. After target launch, VAFB radars and Defense Support Program satellites acquired the target launch vehicle and sent tracking data to a ground station of the BMC3 system for processing. The BM/C3 element operates in a dual node configuration at the Joint National Test Facility (JNTF), Colorado Springs, CO, and Meck Island, KMR. The BM/C3 system transmitted the launch alert and track data to other ground sensors.

The FPQ-14 radar at Kaena Point, HI, acquired the targets and tracked them from horizon to horizon. Although FPQ-14 target trajectory data was transmitted to KMR for use in developing the Weapon Tasking Plan (WTP) by the BM/C3 node, the Range Interface for Test & Evaluation (RITE) unit determined the data did not meet quality requirements and did not forward it to BM/C3. As a result, BM/C3 used available data to generate the WTP and Sensor Tasking Plan (STP) for GBR-P. The GBR-P received target cue messages from BMC3 and began its search. The radar acquired the target objects at a range of approximately 4,000 km. When the target objects were acquired and tracked by GBR-P, it sent report messages to the BM/C3.

From the WTP sent by the BM/C3, the Command Launch Equipment at KMR generated an engagement solution/launch command that was executed by the weapon system. The pre-launch data was transmitted to the EKV just prior to its launch on a two-stage booster from Meck Island.

The interceptor launch occurred at 10:40 pm (EST) and first and second stage booster performance was as expected. During powered flight, Global Positioning System (GPS) data was used to provide track data for the subsequent WTP and the initial In-Flight Target Update (IFTU). Just before first stage burn-out, the nose fairings that protect the EKV from the atmosphere were jettisoned. During the second stage burn, BMC3 combined updated GBR-P data with other track data to develop the second IFTU. The EKV jettisoned its sensor cover and activated its internal power battery just before second stage burn-out. After booster burn-out, the EKV maneuvered to separate itself from the spent stage. It then used its thrusters to orient itself to observe stars twice during a 2 to 3 minute interval to verify its position and adjust its navigational system. Following the star shots and the update of the navigation system, the EKV began to search a volume of space for the targets based on the information contained in the pre-launch Weapons Tasking Plan. The visible light sensor acquired the target complex and directed the EKV thrusters to adjust the trajectory toward the calculated intercept point. The EKV requires an operative infrared sensor in order to transition into its terminal guidance mode prior to intercept. In effect, the visible light sensor steered the EKV into the general vicinity of the target—the infrared sensor should then have taken control to complete the intercept. Apparently, a malfunction occurred during IFT-4 that prevented the infrared sensors from cooling properly. As a result, the infrared guidance needed to complete the intercept was not available. The EKV passed within 100 meters of the target before they both reentered the atmosphere. Meanwhile, the GBR-P acquired the EKV from a BM/C3 cue and tracked both the EKV and targets to the point of intercept. GBR-P performed its target object mapping and kill assessment on commands received from the BM/C3.



The Ground Based Interceptor awaits launch from Meck Island in the Kwajalein Missile Range.

IFT-4 RESULTS

The NMD integrated system performed as expected up to the planned intercept. The target complex was launched and deployed normally. Data from space and ground sensors were integrated into the BM/C3 shortly after target launch. The BM/C3 processed the initial information to determine critical launch and impact point predictions on the target complex. The integration of this early sensor data allowed for the continued tasking, integrated engagement planning, and integration of the remaining NMD assets at the appropriate points on the mission timeline.

After successfully completing the pre-launch, boost and midcourse activities, including star sightings and updating EKV navigation, the EKV readily acquired the target complex very near the center of the EKV field of view. The visible sensor tracked the target objects from an extremely long-range acquisition to within seconds of the predicted intercept point. The EKV maintained the target complex within the center of the field of view leading up to the endgame. At the end of the discrimination phase, the EKV failed to obtain RV track with one of its infrared sensors, which precluded transition to the terminal tracking mode. Without transitioning to the terminal mode, the EKV was unable to complete the intercept. Investigations are centered on cryogenic cooling subsystem since neither infrared sensor reached proper operating temperature. Analysis is ongoing to determine the root cause of this anomaly.

All but two system test objectives were met: the EKV failed to conduct terminal divert and homing maneuvers, and it failed to intercept. Both were dependent on successful EKV transition into terminal mode, which did not occur. All BMC3 and GBR-P functions were successfully exercised in-line in IFT-4, with a direct effect on the conduct of the engagement. Subsequent tests will further build on the direct participation of the BMC3 and GBP-P in the engagement, most notably with the addition of the real-time in-flight communications link between the BMC3 and EKV for transmittal of targeting information and EKV health and status messages.

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